Abstract of the Disclosure

A solid phase or form of carbon is based on fullerenes with thirty six carbon atoms (C_{36}). The C_{36} structure with D_{6h} symmetry is one of the two most energetically favorable, and is conducive to forming a periodic system. The lowest energy crystal is a highly bonded network of hexagonal planes of C_{36} subunits with AB stacking. The C_{36} solid is not a purely van der Waals solid, but has covalent-like bonding, leading to a solid with enhanced structural rigidity. The solid C_{36} material is made by synthesizing and selecting out C_{36} fullerenes in relatively large quantities. A C_{36} rich fullerene soot is produced in a helium environment arc discharge chamber by operating at an optimum helium pressure (400 torr). The C_{36} is separated from the soot by a two step process. The soot is first treated with a first solvent, e.g. toluene, to remove the higher order fullerenes but leave the C_{36}. The soot is then treated with a second solvent, e.g. pyridine, which is more polarizable than the first solvent used for the larger fullerenes. The second solvent extracts the C_{36} from the soot. Thin films and powders can then be produced from the extracted C_{36}. Other materials are based on C_{36} fullerenes, providing for different properties.